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## ENLARGEMENT OF THE THYMUS: A REMARKABLE CASE.

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IN cases of sudden death from apparently trivial causes enlargement of the thymus is often the only feature to be found *post-mortem*. Various opinions have been advanced to explain this remarkable coincidence, but as yet no satisfactory explanation has been given. The original view put forward was that death in these cases was due to laryngismus. Later, it was held that the enlarged thymus, by pressing on the trachea, bronchi, or lungs, caused death simply by its mechanical effects. Some have thought that direct pressure on the heart or blood-vessels induced a fatal syncope, and others, again, ascribe the fatal result to pressure on the nerves (vagi, recurrent laryngeal, &c.) Paltauf has denied the "pressure theories" of the cause of death, and ascribes it to a constitutional condition in these patients which he called the "status lymphaticus."

The present case is one in which the enlarged thymus was the cause of death, undoubtedly by its mechanical effects; but the death, although somewhat sudden in the end, only occurred after symptoms of cardiac failure had been present for some months.

The patient was a moderately well-developed female child,  $4\frac{1}{2}$  years of age, who was admitted to the Glasgow Royal Infirmary, under the care of Dr. Middleton, complaining of gradual enlargement of the abdomen of six months' duration. For three months before admission she had more or less pain

in the left side of the chest and abdomen, and six weeks before admission she had an attack of jaundice which lasted a little over a fortnight. For six weeks before admission her feet and legs had been swollen, and for a fortnight before admission she suffered from swelling of the face and eyelids, most pronounced in the morning. There had been no frequency of micturition, nor any other symptom suggestive of renal disease. There was nothing of note in her previous health beyond the fact that two years before admission she was confined to bed for seven weeks with "congestion of the lungs."

On admission she lay quietly in bed without complaining of pain. Her face was flushed, and covered with a profuse sweat. The pulse was fast, regular, of good quality and low tension; a distinct bulging of the left side of the chest in front could be made out. The area of cardiac dulness was enlarged, the right border being  $1\frac{1}{4}$  inches to the right of the mid-sternal line, the upper border at the level of the fourth rib, and the transverse diameter  $4\frac{1}{2}$  inches. The apex impulse was diffuse, and was most easily felt in the fifth left intercostal space,  $2\frac{3}{4}$  inches from the middle line. The sounds at the apex were very loud, the second being especially booming in character. At the pulmonic area the sounds were also accentuated, but not to such a marked extent as over the mitral area. No murmurs were present in any of the areas. The respirations were frequent and shallow, with an occasional cough, but no spit. On percussion a resonant note was obtained over both lungs, except over the right lower lobe posteriorly. The respiratory murmur was loud and harsh, and over the whole of the right lung was accompanied by loud coarse râles. These were also heard to a slight extent over the left lower lobe in front. No alteration of the vocal resonance was present. The abdomen showed a well-marked distension, particularly evident just above the umbilicus on both sides. The liver was greatly enlarged, the upper border being at the sixth rib in the nipple line, whilst the lower border stretched from a point 4 inches below the costal margin and across the middle line at the level of the umbilicus. The surface of the organ felt smooth, and was not specially tender on palpation. The urine contained a considerable quantity of albumen, but no blood nor sugar; microscopically only a few hyaline casts could be seen.

The temperature rose on the day after admission, and continued to be elevated for the next seven days, after which it remained about normal or slightly subnormal till death.

Throughout, the pulse was increased in frequency. On the ninth day after admission a pericardial friction sound was heard more or less localised to the right of the sternum. On the eleventh day it was noted that the friction sound had entirely disappeared, and the general condition of the child was much improved, although a good many râles were present in both lungs. She continued fairly well for the next two and a half weeks, no friction sound being heard, and the liver becoming much smaller in size. After this period of improvement she had a relapse. Her breathing became rapid and laboured, and the lips and cheeks cyanosed. She complained at times of abdominal pain. She did not sleep at nights, sitting up in bed, apparently unable to lie down with comfort. Pericardial friction again appeared. Two days before death marked swelling of the legs, hands, and face appeared, and with the general œdema and cyanosis, persisted till the end. At this time the respiratory murmur was noted to be tubular all over the right lung, and absolute dulness to percussion was found over the right base posteriorly. No difference in the vocal fremitus was detected. Four ounces of clear fluid were drawn off from the right pleural cavity. The child became very much distressed and very restless, and was unable to sit up without assistance. A quantity of clear fluid was drawn off from the pericardium. In the end the child collapsed rather suddenly, and died thirty-eight days after admission.

At the necropsy, in addition to the general anasarca, some œdema of the connective tissue between the sternum and pericardium was found, and the pericardial sac was filled with clear straw-coloured fluid. The right pleural sac contained a considerable quantity, and the left a small quantity, of serous fluid. The abdomen also contained a considerable quantity of clear fluid. On the front of the right ventricle there was an area of thick fibrinous pericarditis about the size of a shilling. The heart was greatly enlarged, the enlargement obviously affecting the right side to a striking degree. The left ventricle appeared small in comparison with the right, but it was not atrophied. It was slightly dilated, and about normal in thickness. The aortic and mitral valves were healthy. The left auricle was dilated, and its endocardium appeared to be somewhat thickened. The right ventricle was greatly hypertrophied and dilated, the pulmonary valve was healthy and competent, and the tricuspid valve was also healthy, although its orifice was dilated. The right auricle

was enormously dilated and hypertrophied, and filled with blood clot. The coronary arteries were healthy.

The thymus was greatly enlarged, and reddish-purple in colour. It formed a lobulated mass, which involved, to a greater or less degree, all the important structures of the superior and posterior mediastina. The mass was found to consist of three more or less distinct principal portions united together by pieces of thymus and loose connective tissue. One portion rested just above the arch of the aorta; it surrounded the whole circumference of the left innominate vein along the greater part of its course, and part of the circumference of the right innominate vein and of the superior vena cava. The right common carotid and right subclavian arteries, although lying somewhat posteriorly, were also surrounded.

A second portion of the mass formed a lobe about the size of a chestnut, and was situated between the superior vena cava in front and the trachea behind. It surrounded the innominate and the left common carotid arteries, but the left subclavian artery and the aortic arch were free from involvement. This portion of the mass passed downwards and rested upon and in front of the root of the right lung. A third portion, commencing behind the root of the right lung, extended downwards in front of the œsophagus for about 2 inches, and forwards between the right and the left bronchus just at the bifurcation of the trachea. Between this portion and the second portion already described the root of the right lung was compressed. The root of the left lung was uninvolved. Thymus tissue was found extending outwards into the hilus of each lung. Close against the hilus of the right it was seen to surround the pulmonary artery and vein, and to pass in front of the bronchi. Close against the hilus of the left the portion of thymus tissue was situated above the structures, forming its root, but did not surround them.

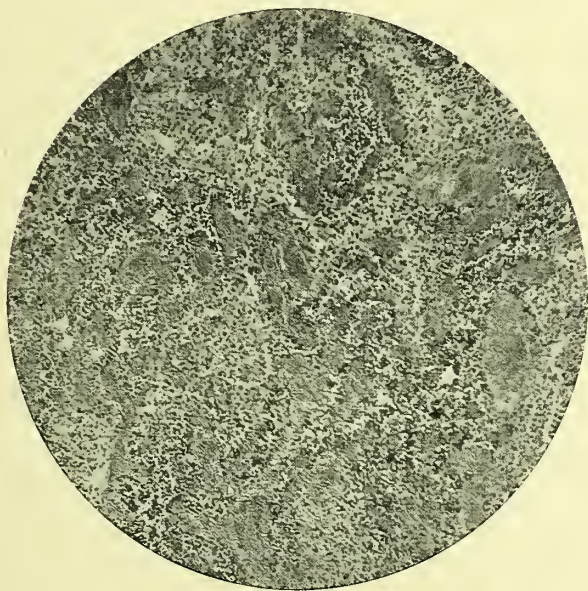
The œsophagus was unaffected.

The right vagus rested upon the right lateral surfaces of the first and third masses, but was not in any way compressed by them. The left recurrent laryngeal nerve rested on the left lateral surface of the first mass, but was not compressed. The vena azygos major passed upwards on the surface of the mass in the right side, and was covered over by some loose fibrous tissue, so that it was possible that it may have been somewhat compressed.

The weight of the principal mass of thymus, including the vessels which it surrounded, was  $2\frac{1}{2}$  oz.



Histologically there is a hyperplasia of the lymphoid tissue, but in the sections examined no Hassal's corpuscles were seen. The most striking feature, however, is the angiomatous condition of the tissue. Throughout the whole structure there are innumerable widely dilated capillaries, some of them being quite cavernous in appearance. They each possess a definite endothelial wall and are engorged with blood. The capillaries and vessels in the connective tissue supporting the glandular structure are also engorged. The predominant cell



Microphotograph of a section from the middle portion of thymus mass,  $\times 90$ . The finely granular areas are the widely dilated capillaries engorged with blood.

is the small round mononuclear. At the periphery of the different masses these are collected into "lymph nodes," as in the normal thymus, but they are also found in groups and infiltrating the whole structure throughout. There is a reticulum, corresponding to the medulla of the normal thymus, in which these small round cells are loosely arranged, and larger endothelioid cells and some polymorphonuclear leucocytes are present. The lymphoid tissue is somewhat more abundant in the upper and lower portions of the mass

than in the middle portion. In the latter the reticulum is slightly more abundant, and the tissue has in consequence a looser appearance.

The lungs showed chronic venous congestion. This was very marked in the right, which was also consolidated from a terminal pneumonia. The liver was greatly enlarged ( $26\frac{1}{2}$  oz.), and showed extreme chronic passive congestion. The spleen and kidneys also showed signs of chronic passive congestion. The mesenteric glands were only very slightly enlarged, but there was no enlargement of either the axillary or the inguinal group, and nothing to suggest the condition known as the "status lymphaticus." The appearances of the lungs, liver, and kidneys were confirmed microscopically.

Death in this case was clearly due to cardiac failure; the two outstanding features found *post-mortem* were enlargement of the thymus and hypertrophy of the right side of the heart, and there can be no doubt that these represented simply cause and effect.

Between the second and third principal portions of thymus mass above described, the root of the right lung was obviously compressed, and, in addition, thymus tissue extended right out to the hilus of this lung, where it surrounded both the pulmonary artery and vein. Owing to the collapsable nature of the pulmonary vein, it is probable that the pressure of the thymus mass told more markedly on it than on the artery. On the left side thymus tissue was found above the structures forming the root of the left lung, but not surrounding them. This accounts for the much less marked chronic venous congestion found on this side. The obstruction of the right pulmonary vein, and the possibly lesser obstruction of the artery, account for the hypertrophied right side of the heart. The chronic passive congestion of the liver, spleen, and kidneys is but a further result. The œdema of the face, which was noted a fortnight before admission, was no doubt due to the compression of the innominate veins in the thymus mass. Although some of the principal arteries were surrounded by the thymus tissue, it is probable that they would be much less affected in this way than the veins. Moreover, the enlargement and hypertrophy of the heart was wholly on the right side, which points to the obstruction being in the pulmonary circulation. The position of the right vagus and left recurrent laryngeal nerves relative to the thymus mass is important. They were situated on the right and left lateral surfaces of the mass respectively, and at the *post-mortem* did not appear to be compressed, but it seemed highly



probable that further growth of the thymus might at any time have involved one or other.

The angiomatous condition of the thymus is difficult to explain.

The vascular channels are present in great numbers, and are the result of dilatation of pre-existing vessels with probably a hyperplasia of them. This suggests tumour growth, and that the condition is one of "angioma of the thymus." The mode of extension of the mass around the great vessels and along the roots of the lungs also lends support to this view.

The other alternative is that the angiomatous condition is simply part of the general venous congestion found elsewhere. The venous return from the thymus is by the internal mammary vein and vena azygos major. The former was outwith the mass of thymus, but the latter passed up on its surface and was possibly compressed.



